

intergrading forms as new sub-species, an opportunity that has been fully availed of by a few ambitious mammalogists more anxious to add to a personal reputation than to be of any special use or aid to the science which they pretend to advance."

This is strong language, but there seems, in some instances, considerable justification for its use.

Of one of the above-mentioned chipmunks, a life-sized figure is given, which may be taken as a good example of the author's own sketches. Excellent as is this figure from a zoological standpoint, it cannot however compare in artistic effect with the reproduction of a photograph taken by the author of the deer-mouse (*Peromyscus leucopus*), which is perhaps the most exquisite in the whole book. The little creature is represented issuing from a maize-cob, on which it has been making a meal, and the half-frightened, stealthy expression of its head is most life-like. Although in our opinion the best of all, this is only one among a number of photographs of various beasts and birds taken by the author himself.

Of the few chapters devoted to mammals, all but one treat of the smaller representatives of the class; but, as if to make up for this, the one exception takes cognisance of the largest of living creatures—to wit, whales. After reading a statement in the introduction to the effect that technical matters were, so far as possible, excluded from the work, we confess to a feeling of surprise at finding nearly three pages of the chapter in question occupied by a technical list of American Cetaceans, many of the names in which are mere synonyms. Apart from this, the chapter is a remarkably interesting one, although it would have been better had some of the illustrations been reduced in size. In view of recent discoveries by the Prince of Monaco, we thought, on first reading the book, that the author was sadly behind the time in his statement that all the markings on Risso's dolphin are normal and not due to conflicts; but this apparent want of revision is fully explained by the date on the title-page. To the same cause may perhaps be attributed the author's relegation of *Zeuglodon* (misspelt, by the way, *Zenglodon*) to a position near the seals, as Prof. Damer's interesting memoir, in which its ancestral cetacean characters are so well brought out, was probably not published in time.

To refer to the other chapters would be to largely exceed our space; and all we can therefore do is to commend the work to the best attention of our readers as an admirable example of what popular natural history should be. Well printed and charmingly and profusely illustrated, it should be welcome alike to young and old, to the professed naturalist and to the non-scientific lover of nature.

R. L.

THE SONGS OF BIRDS.

Cries and Call-Notes of Wild Birds. By C. A. Witchell. Pp. xi + 84. (London: Upcott Gill, 1899.)

IN this book the author carefully describes the cries of over a hundred of the commoner species of birds which are to be heard in or near gardens of towns, woodlands, uplands and riverside. No reader who is at all interested in birds can fail to be impressed with the diligence and patience shown in collecting so much de-

tailed information, and with the extraordinary powers of ear which the author seems to possess.

The cries of birds, as Mr. Witchell implies in his preface, are more readily distinguished from one another by differences of timbre than by differences of musical pitch. Owing to the fact that most birds sing at a very high pitch, it is exceedingly difficult for the human ear to recognise the intervals with certainty. Moreover, the vocal apparatus of a bird is such that he naturally produces several sounds within the compass of one tone of our musical scale; and it is for this reason that nearly all attempts to translate a bird's song into our musical notation are failures. Though familiar with the cries of most of the birds Mr. Witchell mentions, we have been quite unable to recognise several of the strains given in his book when played on the piano. Some of the musical illustrations would remind the hearer of the song if he were already familiar with it, but we doubt if they would convey much idea of it to any one else.

Descriptions of the cries of birds by means of syllables and words are generally very difficult to interpret. It is easy to make the syllables fit the song when that is known, but the syllables give little idea of a song which is unknown to the reader, because there are no universally recognised rules for their pronunciation. Mr. Witchell has been at great pains, but we do not think really satisfactory results can be obtained in the representation of birds' cries by either of the methods he has employed.

There are few inaccurate statements in the book; but the author is mistaken when he writes concerning the song-notes of the great tit, "It is noteworthy that none of our other titmice have any of these cries." The coal tit sings a song not very unlike the ringing note of the great tit, which is represented by the words "chingsee, chingsee." We have spent many hours listening to grasshopper warblers; but we never yet heard one reel for five minutes without a break, nor for even half that time. And we think the author is unjust to the song of the mistle-thrush when he says, "the listener may be led to imagine that some very musical bantam or other such bird is crowing."

In the present work Mr. Witchell has not set himself to discuss the various problems concerning bird-notes, but he incidentally makes assumptions which seem to require more evidence to justify them. Thus he writes:

"In January and February the songs of the blackbird are much shorter than those heard in May, the young birds of the preceding year requiring some practice before attaining proficiency";

and again he says of the skylark:

"These autumn songs seem to be mostly those of young birds of the year, and consist mainly of repetitions of the call-notes, with the addition of a few more musical sounds."

We should like to have more evidence to show that these are songs of the young birds. It is well known that in February many chaffinches can be heard singing which apparently find it difficult to finish the song correctly. Mr. Witchell makes no mention of this; but surely he would not say that all these chaffinches are young birds.

There is yet another point on which we differ with Mr.

Witchell, and that is with regard to mimicry. Undoubtedly several birds are ready to mimic sounds which they hear about them, but it does not follow that every point of resemblance in the songs of two species is due to mimicry; it is quite as likely to be accidental. For instance, it seems to us fanciful to trace the origin of part of the song of a thrush in the following way:

"The 'kreeow' was given in the deliberate manner of the crow; the 'whillillill' was similar to the note of the wryneck; while the 'tewy' was clearly the call-note of the chiffchaff."

In another place we read:

"The nightingale is sometimes inclined to mimic, and one of its strains, a rapid 'slip slip slip' prolonged, is much like the sound made by the young perching nightingale when the parent is feeding it."

It seems curious that the nightingale should mimic the young birds when they are not yet hatched, for, in spite of the fact that nightingales are heard singing in mid-June, we do not believe that they generally sing after their young are hatched; and Mr. Witchell gives no evidence that the birds he heard were not delayed in their nesting owing to the destruction of their first nest.

Mr. Witchell is well known as a specialist in bird-song, and many of his observations could not be made without a carefully trained ear; so his book cannot fail to be of interest. We are doubtful as to the amount of help it would give to a novice wishing to become familiar with the various cries of birds; but it gives a fuller description of these cries than is generally to be found in ornithological works, and suggests many points which are worth further investigation.

H. C. P.

OUR BOOK SHELF.

Psychologische Untersuchungen über das Lesen. By Benno Erdmann and Raymond Dodge. Pp. viii + 360. (Halle, 1898.)

The Story of the Mind. By J. M. Baldwin. Pp. 263. (London: George Newnes, Ltd., 1899.)

PAINSTAKING records of psychological experiments are, as a rule, not the most entertaining form of literature. Yet an exception must certainly be allowed in the case of the work of Drs. Erdmann and Dodge, which is no less distinguished by literary charm than by the thoroughness and completeness of the investigations it records. The greater part of this admirable work is devoted to a careful and, in the judgment of the present reviewer, unanswerable refutation of the opinion which since Wernicke has been current among German pathologists, that in normal reading the letters are spelt out separately, one after another. By a series of elaborate experiments the authors seem to establish beyond a doubt that our apprehension of a written text takes place exclusively during the pauses between the movements of the eye along the lines, that six to seven letters can be clearly perceived during each such pause, and finally that a short word of not more than four letters can be read off in less time than a single letter. In the later chapters Cattell's well-known experiments on reaction-times for written symbols are submitted to a searching criticism; and it is shown from the absence, under normal conditions, of conflicting optical suggestions or of conscious sensory-motor "feelings of innervation" that no element of "discrimination" or "selection" enters into our ordinary apprehension of the meaning of the symbol. As this means that simple apprehension is *not*

"discrimination" of any kind, the result is an important one, and may be commended to the attention of those psychologists who still talk glibly of "discrimination" as the essential feature in perception. Altogether the book is a model of what a psychological monograph should be, clear, well-arranged, and most accurate.

Prof. Baldwin's little book is a valuable addition to the series in which it appears, and should awaken the interest of not a few intelligent general readers outside the little world of psychologists by profession. It is remarkable that he should have been able in so few pages to introduce his readers to almost every side of psychology. The most excellent feature of the book is probably the abundant illustration, from Prof. Baldwin's own researches, of the meaning and nature of psychological experiment. If one were in a fault-finding mood one might, perhaps, complain that the curious attack upon the teaching of language at p. 222 is both exaggerated and irrelevant, and that the concluding chapter on "The Genius and his Environment" is hardly definite enough in its results to justify its being reprinted from the popular magazine in which, no doubt, it has made a previous appearance.

A. E. TAYLOR.

Sewage Analysis. By J. Alfred Wanklyn and W. J. Cooper. Pp. xiv + 220. (London: Kegan Paul, Trench, Trübner, and Co., Ltd., 1899.)

Sewer Design. By H. N. Ogden, C.E. Pp. viii + 234. (New York: John Wiley and Sons. London: Chapman and Hall, Ltd., 1899.)

THE first of these two volumes is described as "a practical treatise of the examination of sewage and effluents from sewage." Many practical hints on the analysis and treatment of sewage are given; and the collection of original papers printed as an appendix contains useful notes and explanations on various analytical processes in chemistry. The object of the book is, however, stated to be to bring about a reformation in the analysis of sewage, and to point the way to its proper disposal. Apparently one of the chief reforms required, according to Mr. Wanklyn, is to induce chemists using the ammonia process of water analysis to express the readings of albuminoid ammonia in terms of parts per million, instead of parts per 100,000 and grains per gallon. But other reforms are urged; and as Mr. Wanklyn claims that "In some respects the opportunities enjoyed by my colleague and myself are absolutely unique," and remarks that "the severance of all relations with the London Chemical Society has operated to our advantage," the volume evidently contains criticisms and conclusions upon which a difference of opinion may be permitted.

Prof. Ogden's volume contains a course of lectures given in the College of Civil Engineering, Cornell University. It shows how the subject of sewer design may be dealt with scientifically, and therefore practically. Much scattered material upon points which have to be considered when preparing the design and making the plans for a system of sewers in a city, has been brought together by the author. Sanitary engineers will find the volume as serviceable for reference as students of sanitary engineering will find it helpful as a text-book.

The Hygiene of the Mouth, a Guide to the Prevention and Control of Dental Diseases. By R. Denison Pedley, F.R.C.S. Edin., L.D.S. Eng. Pp. 93. (London: J. P. Segg and Co.)

THE importance of taking care of the teeth of children cannot be too strongly emphasised or too widely understood. In this volume the author describes the measures to be adopted for the prevention of dental diseases in adult life, the progress and treatment of dental caries, and some of the consequences of neglect of the teeth. The facts contained in the book should be known to every parent.